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REPRODUCTION BY JUVENILE COMMON GROUND DOVES IN SOUTH TEXAS

MICHAEL F. PASSMORE

Breeding at less than 10–12 months of age is rare among birds (Skutch 1976). Most species breeding in their first calendar year are passerines (Miller 1955, 1959) or domesticated forms (Esner 1960, Johnston 1962). Stubble Quail (*Coturnix novaezealandiae*) and Japanese Quail (*C. coturnix*) can breed when 4 months old if environmental conditions are favorable (Disney 1978).

Reproduction by juveniles has been reported for several species of Columbiformes. Irby and Blankenship (1966) reported nesting by juvenile Mourning Doves (*Zenaida macroura*) in Arizona. Precocial testicular development has been found in juvenile Mourning Doves as far north as Ontario (Armstrong and Noakes 1977). Murton et al. (1974) noted that Eared Doves (*Z. auriculata*) were able to breed in captivity at 4–5 months of age; apparently, many wild juveniles of that species bred during their first year. Evidence of breeding by a juvenile Common Ground Dove (*Columbina passerina*) was described by Johnston (1962). The objective of my study was to determine both the extent of juvenile reproductive activity in a wild population of Common Ground Doves, and the significance of this phenomenon for the annual reproductive output of the population.

STUDY AREA AND METHODS

Reproduction in juvenile ground doves was studied during May 1978 through October 1980 on two cattle ranches near Dinero, Live Oak Co., Texas. The Twin Oaks Ranch (TOR) encompassed nearly 8100 ha, situated along the western edge of Lake Corpus Christi.

My main study area on the TOR was in an 810-ha pasture, 2 km northwest of Lagarto, Texas. Most of the pasture had recently been aerially sprayed for control of mesquite (*Prosopis glandulosa*) which created an abundance of dead-snag mesquites surrounded by dense clumps of shrubs (mainly agarito [*Berberis trifoliolata*], *Lantana* sp., and blackbrush [*Acacia rigidula*]). Periodic shredding of low brush on the sandy soil stimulated excellent growth of annual grasses and forbs which supported an abundance of doves.

The second study area was on the 1200-ha C. N. Freeman Ranch, 3 km north of Dinero. This area was mainly rolling hills covered by mesquite, live oak (*Quercus virginiana*), and chaparral. Chaparral species were mainly blackbrush, colima (*Zanthoxylum fagara*), and ceniza (*Leucophyllum frutescens*). Approximately 80% of the brushland on the ranch had recently been chained; most of the cleared land was converted to coastal Bermuda grass (*Cynodon dactylon*).

Ground doves were mainly collected by mist nets set near feeding areas or stock tanks; a few birds were collected by shooting. Sacrificed ground doves were placed in a portable cooler to minimize dessication. Within 12 h of collection (most within 1–4 h), gonads were removed from the body cavity and measured with Vernier calipers to the nearest 0.1 mm.

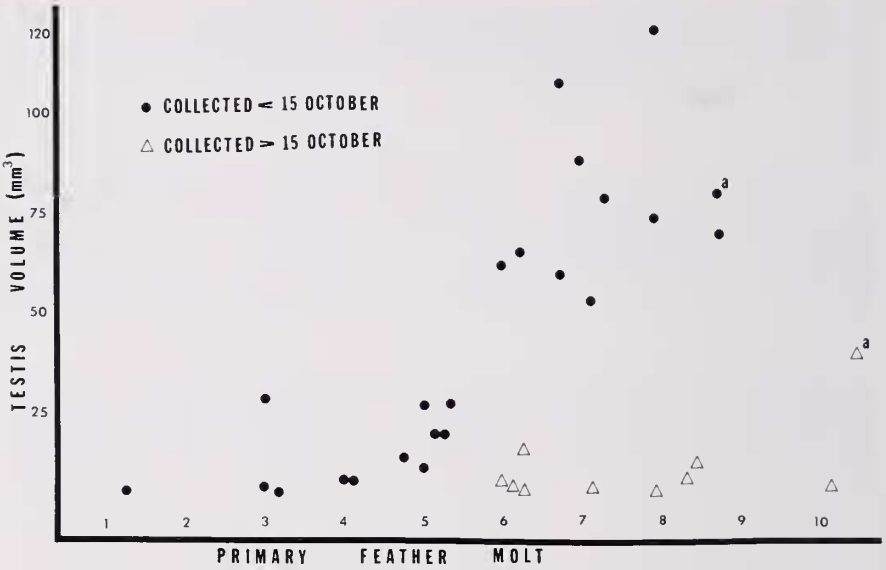

FIG. 1. Relation of testicular volume (mm^3) to the stage of primary feather molt of juvenile ground doves collected during April–15 October and 16 October–December 1978–1980 in Live Oak County, Texas. Primary molt stage represents the percent of replacement for each primary, i.e., molt stage 7.5 indicates P-7 was one-half replaced. a = juveniles with active crop milk glands.

Diameter of the largest ovarian follicle was recorded for females. For males the length and width of the left testis was recorded. Testicular volume was estimated using $V = 4/3\ W^2\ L$, where V = volume, W = ½ width, and L = ½ length (Lofts and Murton 1966, Gutierrez et al. 1975). Crop glands were classed as active (producing crop milk) which included developing and regressing stages, and inactive (Zeigler 1971). Additionally, ovaries were macroscopically examined for evidence of ovulated follicles. Ovulated follicles appeared as flaccid, dark follicle membranes within the ovary.

Juveniles were identified by the presence of white-tipped upper wing coverts, white-tipped allulars, and a Bursa of Fabricius. Molt discussed herein refers to the loss of a feather, and undifferentiated follicles refer to ovarian follicles of approximately the same granular size (<1 mm).

RESULTS

Gonadal activity.—A total of 74 juvenile ground doves were sacrificed during the 3-year period. Of those, 71 (33 male, 38 female) provided paired measurements of primary feather molt and gonadal sizes.

Testicular enlargement in juvenile males began concurrently with the molt of their fifth primary (P-5) (Fig. 1). All juvenile males that had molted at least P-6 and were taken prior to 15 October (N = 11), had

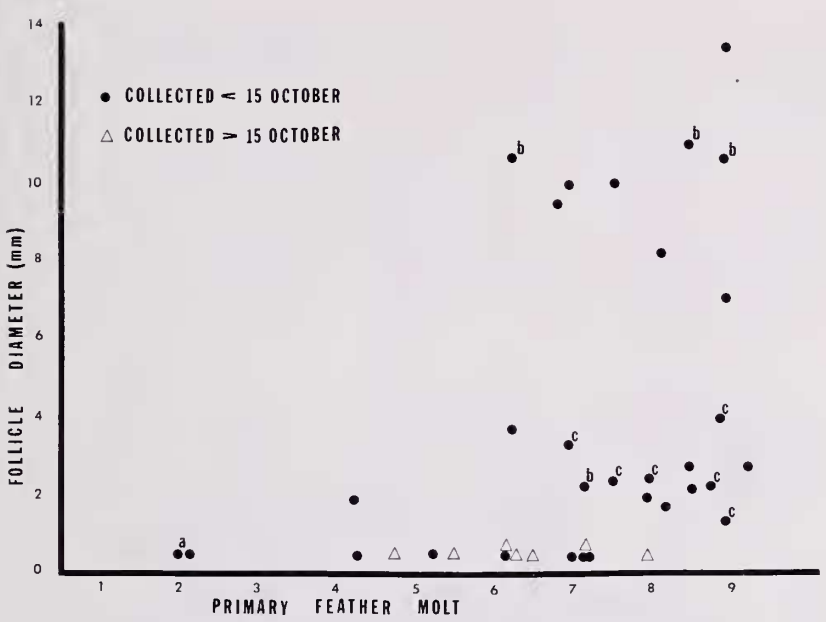

FIG. 2. Relation of the diameter of the largest follicles (mm) to the stage of primary feather molt of juvenile ground doves collected during April–15 October and 16 October–December 1978–1980 in Live Oak County, Texas. Primary molt stage represents the percent of replacement for each primary, i.e., molt stage 7.5 indicates P-7 was one-half replaced. a = undifferentiated ovary assigned a value of 0.5 mm; b = partially shelled egg present in oviduct; c = active crop gland.

testicular volumes greater than 50 mm^3. One juvenile that had molted P-3 had a testicular volume of 28 mm^3; a small percentage of juvenile males may therefore become sexually mature earlier than the majority of their cohorts.

The mean testicular volume for adults during the breeding season was 129 mm^3 (range = 73–197 mm^3) (Passmore 1981). Although 7 of 11 juveniles that had molted P-6 had testicular volumes within the adult range, only one had a testicular volume (121 mm^3) near the adult mean. Because no information is available on the minimum testicular volume required for successful breeding in the Common Ground Dove, I could not determine which juvenile males were sexually mature based on gonadal volume.

Regression of testes in juveniles was similar in timing to that of adults. Ten juvenile males that had molted at least P-6 were collected during late October; their mean testicular volume was 9.8 mm^3 (range = 2–39 mm^3).

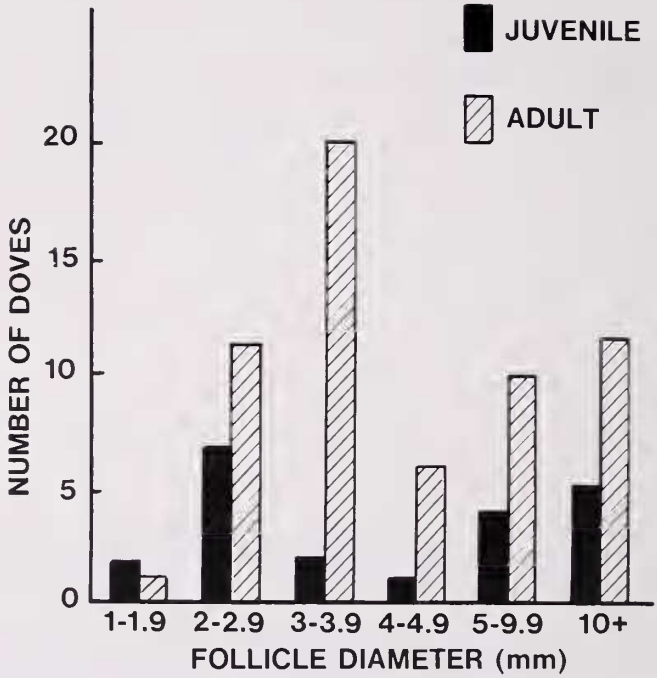

FIG. 3. Frequency distribution of largest follicles in adult and juvenile ground doves collected during 1978–1980 in Live Oak County, Texas.

All seven adult males taken during January and February had testicular volumes less than 10 mm^3.

More direct evidence of breeding was observed in juvenile females. Enlarged ovarian follicles were evident in most (22 of 26) juveniles after P-6 had been molted (Fig. 2). One female that had molted P-4 had an enlarged follicle (1.9 mm), again suggesting that some juveniles become sexually mature at an earlier age than most of the juvenile population. There was a difference ($\chi^2 = 12.9$, df = 5, $P < 0.05$) in the frequency distribution of follicle sizes in adults and juveniles during the breeding season (Fig. 3).

Unlike males, in which all juveniles molting P-6 or more had enlarged testes, 15% (4 of 26) of the females that had molted P-6 or more did not have differentiated follicles. No relationship was found between the lack of gonadal activity in those females and the months in which they were collected.

Nine juvenile females had ovarian follicles larger than 6.0 mm in diameter; I assumed those follicles were enlarging prior to ovulation, based

on the size of the quiescent stage (2.0–4.0 mm) of the follicles (Fig. 2). Three doves with follicles larger than 6.0 mm also had partially shelled eggs in their oviducts. Two with oviducal eggs also had two enlarged follicles (11.0 and 7.0 mm; 10.6 and 8.2 mm) in the ovaries. As the normal clutch-size is two in this dove (Bent 1932; Passmore, unpubl.), those birds with oviducal eggs and two enlarged follicles were apparent anomalies. This physiological phenomenon was not observed in adults. It was possible that enlarged follicles may degenerate following the laying of the second egg. Overall, 89% (33 of 37) of all juveniles (males and females) that had molted P-6 or more prior to mid-October had enlarged gonads.

Crop gland activity.—Presence of active crop glands in ground doves was interpreted as evidence of a successful hatching (Zeigler 1971). One juvenile male collected in August 1979 (P-8 ¾ replaced; $V = 79$ mm^3) had an active crop gland (Fig. 1). Five of 21 juvenile females had active crop glands; the proportion of adult females with active crop glands (14 of 59) was nearly identical ($\chi^2 = <0.01$, $df = 1$, $P > 0.05$).

Four of 11 juvenile females with follicles of 2.0–4.0 mm in diameter (estimated quiescent range) had active crop glands (Fig. 2). One female taken in September 1979 had a follicle of 1.4 mm in diameter and active crop glands. This bird may have terminated its ovarian cycle for the season and was in the refractory stage.

DISCUSSION

A paucity of information exists on the contribution by birds-of-the-year to the annual reproductive output of a population. Brown (1967) suggested that juvenile Mourning Doves in Arizona may effect an increase of 1–4% in the annual production. He estimated that approximately 14% of the juveniles sampled were reproductively mature and that some bred at the age of 90 days.

The contribution by juvenile Common Ground Doves to the annual recruitment of the population appeared to be substantial. A simulation model was developed to estimate this contribution (Fig. 4).

I selected an initial population of 500 pairs of adults (second year or older). The breeding season was estimated to be 24–28 weeks long, based on gonadal patterns of ground doves collected during this study. The time required for egg-laying, incubation, and fledging was estimated to be 28 days. Additionally, there is a period of unknown length between the departure of fledglings and the laying of the next clutch. Skutch (1956) and Haverschmidt (1953) found this period to be 8–31 days for consecutive broods of Ruddy Ground Doves (*Passerina talpicoti*). Thus, ground doves in south Texas may have three successful nestings during the 6–7 month

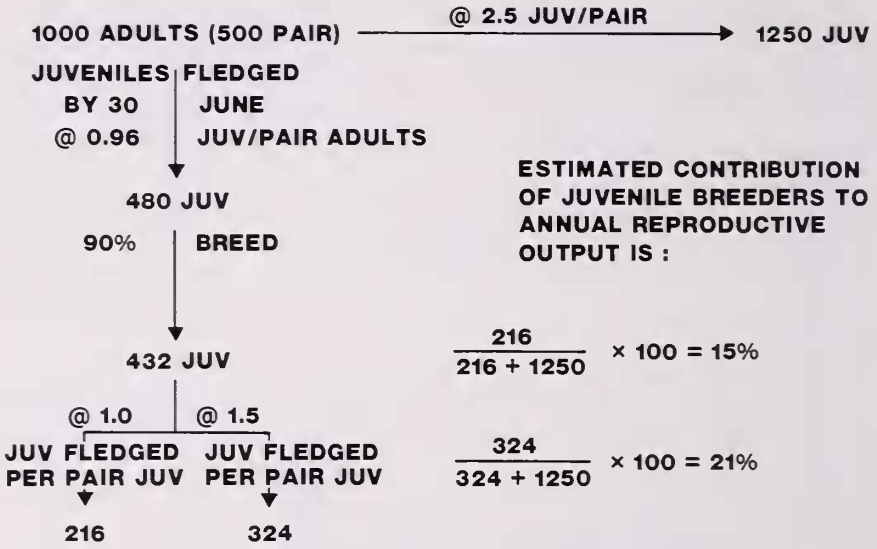

FIG. 4. Simulation model of the contribution of breeding by juvenile ground doves to the annual productivity of a ground dove population. See text for explanation.

breeding season. An annual production rate of 2.5 young per pair of adults represents 42% egg success based on an assumed two eggs per nest. Annual production of the 500 pairs of adults was therefore estimated to be 1250 young.

Without having direct evidence of production from marked or captive pairs of ground doves, I believed 2.5 young per pair to be a realistic estimate. Skutch (1956) reported a 20% egg success of Ruddy Ground Dove nests (two nestings per year). Swank (1955) found Mourning Doves in Texas had approximately 60% nesting success and produced slightly over three young per pair, based on wings collected during the hunting season. Hanson and Kossack (1963), working in an area where Mourning Doves averaged two nestings per year, found production of about 2.4 young per pair.

To estimate the contribution of breeding by juveniles, I first estimated the number of juveniles which had fledged by the end of June. These juveniles would thus be at least 80 days old (most over 100 days) by 1 September; theoretically, all should have an opportunity for at least one breeding attempt. This estimate was based on the mean age ratio (0.46 juveniles/adult, N = 297) of ground doves captured in June of 1978 and 1979.

Based on data previously presented concerning gonadal sizes (Figs. 1, 2), I estimated 90% of those juveniles fledged by the end of June would become sexually active. I assumed all juveniles with enlarged gonads would breed. Two scenarios were envisioned in which the average production per pair of juveniles was arbitrarily selected to be 1.0 or 1.5 young. Those juveniles hatched in April had time to complete two nestings (and thereby produce 1.5 young) by late October. However, birds fledged in June likely were able to complete only one nesting (producing 1.0 young).

Hence, juveniles fledged by 30 June could contribute 216–324 (15–21%) of the annual reproductive capabilities of the hypothetical population (Fig. 4). Further research may substantially refine these estimates depending on behavioral characteristics and reproductive success of juvenile ground doves.

Early sexual maturation in a juvenile ground dove in Florida was reported by Johnston (1962). Johnston collected a juvenile female which had a partially shelled egg in the oviduct and two ovulated follicles. The fifth primary apparently was ¼–½ replaced, indicating to Johnston that the dove's age was between 5 and 6 months. My data indicated that a ground dove with P-5 one-half replaced would be approximately 2.5 months old. I did not observe evidence of breeding prior to the molt of P-6 in juveniles (Figs. 1, 2). A difference may therefore exist in maturation schedules between ground doves (*C. p. pallescens*) in south Texas and those (*C. p. passerina*) in southern Florida.

SUMMARY

Reproductive activity in juvenile Common Ground Doves (*Columbina passerina*) was studied in mesquite-brushland habitats in south Texas from 1978–1980. Juveniles were reproductively active near the time they molted their sixth juvenal primary, at approximately 79 days of age. Evidence of breeding included enlarged testes, differentiated ovaries, active crop glands, and oviducal eggs. The contribution of juvenile breeders to the annual recruitment of the population was estimated to be 15–21%.

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920 ORIOLE, WALLA WALLA, WASHINGTON 99362. ACCEPTED 12 JAN. 1984.